

CLAIMS

What is claimed is:

1. A bonding method of bonding first and second members to one another, said bonding method comprising the steps of:
 - positioning thermosetting resin between said first member and said second member;
 - bonding said first member to said second member by heating and curing said thermosetting resin by irradiation of electromagnetic waves onto said thermosetting resin, wherein said second member is composed of a material that absorbs a first part of said electromagnetic waves and allows a second part of said electromagnetic waves to pass therethrough; and
 - said second part of said electromagnetic waves passing through said second member irradiating said thermosetting resin.
2. The bonding method according to claim 1, wherein at least some of the radiant heat generated by said second member as a result of said absorption of said first part of said electromagnetic waves is conducted to said thermosetting resin to assist in heating said thermosetting resin.
3. The bonding method according to claim 1 wherein said second part of said electromagnetic waves that pass through said second member to irradiate said thermosetting resin result in the generation of radiant heat by said thermosetting resin.
4. The bonding method according to claim 1, wherein said electromagnetic waves are near infrared rays.

1 5. The bonding method according to claim 4 wherein said near infrared rays have
2 wavelengths within the range of about 800 nm to about 1200 nm.

1 6. The bonding method according to claim 1, wherein said electromagnetic waves irradiate
2 said thermosetting resin after said first member is heated to a specified temperature.

1 7. The bonding method of claim 1 further including cooling the bonded first and second
2 members and said thermosetting resin, said cooling including the step of subheating said
3 first member.

8. A bonding method for bonding first and second members to one another, said bonding
method comprising the steps of:

positioning thermosetting resin between said first member and said second member;

heating said thermosetting resin to a curing temperature;

cooling said heated thermosetting resin; and

6 executing a temperature difference suppression procedure during said cooling of said
7 thermosetting resin to effectively reduce the temperature difference between said first
8 and second member.

1 9. The bonding method according to claim 8, wherein said executing of said temperature
2 difference suppression procedure comprises suppressing cooling of a selected one of said
3 first member and said second member during said cooling step.

1 10. The bonding method according to claim 9, wherein said executing of said temperature
2 difference suppression procedure comprises accelerating cooling of the other of said first
3 member and said second member during said cooling step.

1 11. The bonding method according to claim 8, wherein the temperatures of said first member
2 and/or said second member are determined; and

3 said executing of said temperature difference suppression procedure is based on the
4 determined temperatures of said first member and/or said second member.

12. The bonding method according to claim 8, wherein said cooling step accelerates cooling
of the member having the larger thermal capacity of said first member and said second
member, and said cooling step suppresses cooling of the member having the smaller
thermal capacity of said first member and said second member.

13. The bonding method according to claim 8, wherein said first member and said second
member are cooled to room temperature during said cooling step.

14. A bonding apparatus for performing bonding of a first member to a second member using
a thermosetting resin adhesive that is heated and cured during said bonding, said bonding
apparatus comprising:

a support member adapted for having said second member positioned thereon;

a light source that generates near infrared rays for heating said thermosetting resin
adhesive, said near infrared rays passing through said support member;

a heater for heating said first member; and

8 a cooling system for cooling said first member and said second member.

1 15. The bonding apparatus according to claim 14, wherein said near infrared rays irradiate
2 both said thermosetting resin adhesive and said second member.

1 16. The bonding apparatus according to claim 14, further including a pressure member for
2 applying pressure onto said first member during said irradiating of said thermosetting
3 resin adhesive and said second member.

4 17. The bonding apparatus according to claim 14 further including cooling members for
directing cooling medium onto said second member during cooling thereof.

18. The bonding apparatus according to claim 14, wherein said heater is positioned on said
first member.

19. The bonding apparatus according to claim 18 further including a pressure member for
applying pressure onto said first member and a buffer member located between said
pressure member and said first member.

1 20. A bonding method for bonding a silicon chip and a glass substrate using thermosetting
2 resin, said bonding method comprising the steps of:

3 positioning thermosetting resin between said silicon chip and said glass substrate;

4 heating said silicon chip to a specified temperature;

5 irradiating near infrared rays onto said glass substrate to heat said glass substrate, a part of
6 said near infrared rays passing through said glass substrate for irradiating said
7 thermosetting resin, said thermosetting resin being heated by said part of said near

infrared rays and the heat generated by said glass substrate as a result of said near infrared rays irradiating said glass substrate; and

cooling said heated silicon chip, said thermosetting resin and said glass substrate so as to assure an acceptable temperature difference between said silicon chip and said glass substrate during said cooling.

21. The bonding method according to claim 20, wherein cooling of said silicon chip is suppressed and cooling of said glass substrate is accelerated during said cooling step.